

REMARKS

Claims 1-30 are pending in this application, with claims 1, 2, 6, 12, 13, 16, 22, and 23 being independent claims. By this Amendment, claims 13 and 30 have been amended to correct minor typographic errors. No new matter has been added.

As an initial matter, Applicants wish to express sincere appreciation to the Examiner for the courtesy extended to Applicants' counsel during the personal interview held on July 21, 2004. At the interview, various rejections outstanding in the final Office Action were discussed. The following remarks reflect the subject matter discussed during the interview.

In the final Office Action, the Examiner rejected: claims 13, 14, and 20 under 35 U.S.C. § 112, second paragraph, as being indefinite; claim 1 under 35 U.S.C. § 102(b) as being anticipated by Sagusa et al. (Japanese Patent Application Publication No. 09-165681); claims 6, 8-11, 16, 19-21, 27, and 29 under 35 U.S.C. § 103(a) as being unpatentable over McMillin et al. (U.S. Patent No. 5,835,334); claims 2, 5, 7, 12, 13, 17, 28, and 30 under 35 U.S.C. § 103(a) as being unpatentable over McMillin et al. in view of Sagusa et al. and Shackelford (Introductions to Materials Science for Engineers); claims 3, 4, 14, 15, 24, and 26 under 35 U.S.C. § 103(a) as being unpatentable over McMillin et al., Sagusa et al., and Shackelford, in view of Wang et al. (U.S. Patent No. 5,755,886); claim 18 under 35 U.S.C. § 103(a) as being unpatentable over McMillin et al. in view of Fukasawa et al. (U.S. Patent No. 5,310,453); claims 22 and 23 under 35 U.S.C. § 103(a) as being unpatentable over Watmough (U.S. Patent No. 4,404,262) in view of Sagusa et al.; and claim 24 under 35 U.S.C. § 103(a) as being unpatentable over Sagusa et al. in view of Wang et al.; and claim 25 under 35 U.S.C. § 103(a) as being unpatentable over Sagusa et al. in view of McMillin et al.

For the reasons explained below, Applicants respectfully request that the Examiner reconsider the present application and withdraw all the rejections outstanding in the final Office Action.

35 U.S.C. § 112, Second Paragraph, Rejection

Claims 13, 14, and 30 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. In particular, the Examiner pointed out that the terms “core metal” and “electrostatic” in claims 13 and 30, respectively, lack proper antecedent basis. In response, Applicants have amended claims 13 and 30, without narrowing their scope, to supply an expressed antecedent basis for those terms therein. Thus, Applicants respectfully request reconsideration and withdrawal of this rejection under 35 U.S.C. § 112, second paragraph.

35 U.S.C. § 102 Rejection Based on Sagusa et al.

Claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by Sagusa et al. For the following reasons, Applicants respectfully request reconsideration and withdrawal of this rejection.

Independent claim 1 recites an electrode including, among other things, a heater arranged on a plane, an upper ceramic-metal composite arranged above the heater, and an lower ceramic-metal composite arranged below the heater. The heater and the upper and lower ceramic-metal composites are cast in the base metal, and each of the upper and lower ceramic-metal composites comprises a preformed porous ceramic infiltrated with the base metal.

Sagusa et al. discloses a heater plate 10, in which a sheathed heater 11 is embedded in a plate of aluminum ceramic composite 12. The entire surface of the

aluminum ceramic composite 12, except its terminal, is covered with an aluminum rolled material 13. The aluminum ceramic composite is formed with a mixed powder containing 30~90 wt.% aluminum and 70~10 wt.% ceramic.

The Examiner asserted that the aluminum rolled material 13 and the aluminum ceramic composite 12 of Sagusa et al. correspond to the recited base metal and upper and lower ceramic-metal composites, respectively. The aluminum ceramic composite 12, however, does not comprise a preformed porous ceramic infiltrated with the base metal, as recited in independent claim 1. Instead, the composite 12 is preformed of a mixed powder of aluminum and ceramic materials to form a ceramic-metal composite. Moreover, the aluminum-metal composite 12 cannot be infiltrated with the aluminum rolled material 13 (i.e., asserted by the Examiner to correspond to the base metal) because, among other reasons, the aluminum rolled material 13 merely covers the entire outer surface of the composite 12 without any infiltration of materials therebetween.

Furthermore, Sagusa et al. also fails to disclose or suggest, among other things, the sheathed heater 11 and the aluminum ceramic composite 12 being cast in a base metal, as recited in independent claim 1. Instead, as mentioned above, the heater 11 and the composite 12 of Sagusa et al. are merely covered with the aluminum rolled material 13 by, for example, an isostatic pressing method. See claim 1 and paragraph [0014] of the translation provided by the Examiner. Despite this apparent distinction between the claimed invention and the teachings of Sagusa et al., the Examiner appears to assert that the term “cast” broadly encompasses, for example, placing or

throwing something inside. Applicants respectfully traverse this assertion because such an interpretation of the term “cast” is unreasonable and improper.

Pending claims in a patent application must be given their broadest reasonable interpretation consistent with the specification. In re Hyatt, 211 F.3d 1367, 1372 (Fed. Cir. 2000) (Emphasis Added). And, the broadest reasonable interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. In re Cortright, 165 F.3d 1353, 1359 (Fed. Cir. 1999). In this case, the Examiner’s interpretation is inconsistent not only with the specification, but also with any reasonable interpretation that one of ordinary skill in the art would reach. For example, the term “cast” is a term of art, well-known in the metallurgical art, and is used to designate a product or process in which the product is formed by pouring or injecting, for example, a liquid material in a mold to form a predetermined shape. Therefore, the Examiner’s interpretation of the term “cast” without due regard to the ordinary technical meaning thereof is unreasonable and improper.

For at least these reasons, Sagusa et al. cannot anticipate independent claim 1. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

35 U.S.C. § 103 Rejection Based on McMillin et al.

Claims 6, 8-11, 16, 19-21, 27, and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over McMillin et al. (U.S. Patent No. 5,835,334), according to the rationale in paragraphs 7 and 10 of the final Office Action. Applicants respectfully traverse this rejection and request reconsideration and withdrawal of this rejection.

Independent claim 6 recites a susceptor including, among other things, “an upper ceramic-metal composite arranged above the heater” and “a ceramic electrostatic chuck

... having a coefficient of linear thermal expansion substantially the same as that of the upper ceramic-metal composite, and being joined to an upper surface of the upper ceramic-metal composite.” Independent claim 16 recites a plasma processing apparatus including, among other things, a susceptor having a similar structural configuration as that of independent claim 6.

The Examiner asserts in paragraph 7, subparagraph iv, that McMillin et al. discloses “[t]he electrostatic chuck (1 or 100; Figure 1) having a coefficient of linear thermal expansion substantially the same (column 5, lines 41-47 - at temperature below 200 °C) as that of the upper ceramic-metal composite [i.e., dielectric layer 1c] and being joined to an upper ceramic-metal composite.” Col. 5, lines 41-47, of McMillin et al., however, contains the following passage:

For the anodized aluminum cap, the cap temperature is typically maintained at $\leq 200^{\circ}\text{C}$. (usually $100\text{-}150^{\circ}\text{C}$) to prevent cracking of the anodization due to differing thermal expansion coefficient for the anodized layer and base material. For the diamond or ceramic coated design, the cap temperature can be higher, but is typically $< 350^{\circ}\text{C}$.

As this passage of McMillin et al. plainly suggests, due to the difference in thermal expansion coefficient between the anodized layer and the base material, the cap temperature must be maintained below 200°C , i.e., in the range where material expansion does not occur, in order to prevent cracking of the anodized layer. In other words, contrary to the Examiner's assertion, McMillin et al. specifically discloses that the anodized layer (i.e., construed by the Examiner as corresponding to the recited upper ceramic-metal composite) has a different coefficient of linear thermal expansion from that of the base material (i.e., construed by the Examiner as corresponding to the recited ceramic electrostatic chuck). Therefore, McMillin et al. does not disclose, teach,

or suggest, among other things, “a ceramic electrostatic chuck ... having a coefficient of linear thermal expansion substantially the same as that of the upper ceramic-metal composite,” as recited in independent claim 6.

In response to the Applicants’ remarks filed on December 31, 2003, the Examiner asserts that McMillin et al. only states that processing temperature is maintained in a favorable range so that the difference in thermal expansion does not lead to cracking. See the paragraph bridging pages 11 and 12 of the final Office Action. The Examiner’s admitted statement of McMillin et al. above, however, is a clear indication that the coefficient of linear thermal expansion of the anodized layer is different from that of the base material. Due to this difference in the thermal expansion coefficient, McMillin et al. suggests maintaining the cap temperature below 200° where the material expansion does not occur.

Furthermore, relying on several court cases relating to the intended use limitation, the Examiner appears to assert that the recited feature of thermal expansion coefficient is an intended use limitation. Applicants respectfully submit that the thermal expansion coefficient is a structural limitation defining material characteristics of the ceramic electrostatic chuck and the ceramic-metal composite. Therefore, the Examiner’s interpretation of that limitation as an intended use is erroneous. At the interview, the Applicants’ counsel pointed out this error to the Examiner, and the Examiner agreed with the counsel that such interpretation is improper. Thus, withdrawal of this ground of rejection is respectfully requested.

The Examiner further asserted that, since McMillin et al. teaches maintaining favorable processing conditions to prevent cracking of the anodized layer, resulting from

the difference in the thermal expansion coefficient between the anodized layer and base material, McMillin et al. teaches the recited feature of claim 6. See paragraph 17 of the final Office Action. Applicants respectfully disagree with this assertion. The coefficient of linear thermal expansion is an inherent material property and therefore cannot be altered by subjecting the material to a different operating condition. While McMillin et al. discloses maintaining an operating temperature in a region where the expansion does not occur, that does not necessarily suggest that the coefficient of thermal expansion is selectively altered to match that of the neighboring material. Instead, it merely suggests that the two different materials (i.e., anodized layer and base material) are maintained in a temperature range where they do not expand appreciably to prevent material cracking resulting from the difference in coefficient of thermal expansion.

Moreover, McMillin et al. does not disclose “a ceramic electrostatic chuck ... being joined to an upper surface of the upper ceramic-metal composite,” as recited in independent claim 6. As discussed above, the Examiner construed that the anodized layer, or the dielectric layer, 1c corresponds to the recited upper ceramic-metal composite, and that the electrode cap 1 corresponds to the recited ceramic electrostatic chuck. See paragraph 7, subparagraphs ii and iv, of the Office Action. The electrode cap 1, however, is joined to a lower surface, rather than an upper surface, of the dielectric layer 1c. Therefore, McMillin et al. does not disclose, teach, or suggest, among other things, “a ceramic electrostatic chuck ... being joined to an upper surface of the upper ceramic-metal composite,” as recited in independent claim 6.

In response to the Applicants' remarks, the Examiner asserts that “the upper ceramic-metal composite has plural upper surface” and that the interface between

electrode cap 1 and the dielectric layer 1c (asserted by the Examiner to correspond to the recited upper surface) meets the structural configuration of claim 6. It is unclear how the Examiner could construe the claimed upper ceramic-metal composite as having a plurality of upper surfaces because the claim clearly sets forth an upper surface of the upper ceramic-metal composite. Regardless of this apparent mischaracterization (e.g., regardless of whether the upper surface of the upper ceramic-metal composite has a plurality of surfaces), the electrode cap 1 still joins the lower surface of the dielectric layer 1c.

For at least the reasons set forth above, independent claims 6 and 16, and their respective dependent claims, define non-obvious subject matter over the disclosure of McMillin et al. Thus, Applicants respectfully request reconsideration and withdrawal of these rejections.

35 U.S.C. § 103 Rejection Based on McMillin et al. and Sagusa et al.

Claims 2, 5, 7, 12, 13, and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over McMillin et al. in view of Sagusa et al. and Shackelford, according to the rationale discussed in paragraph 8 of the final Office Action. In view of the following reasons, Applicants respectfully request reconsideration and withdrawal of this rejection.

Independent Claims 2 and 13 and Their Dependent Claims

Independent claim 2 recites an electrode including, among other things, “a base metal formed of a cast metal,” “a heater embedded in the base metal and arranged on a plane,” and “a core metal plate embedded in the base metal and arranged substantially parallel to the plane and adjacent to the heater,” “wherein the heater and the core metal

are cast in the base metal, and the core metal plate is entirely surrounded by the base metal and is entirely in metal-to-metal contact with the base metal, and wherein a material forming the core metal plate has a rigidity higher than that of a material forming the base metal.” Independent claim 13 recites a plasma processing apparatus including an electrode having similar recitations to those of independent claim 2.

The Examiner asserts that “[i]t would have been obvious [...] to replace Sagusa’s ceramic-metal composite (12, “cordierite (2MgO, 2Al₂O₃, and 5SiO₂) of ceramics” [0012]) and heater (11) with McMillin’s electrode (1; Figure 1), heater (6a), and core metal plate (2) embedded, and joined ([0015] in Sagusa), in Sagusa’s base metal such that McMillin’s core metal plate is entirely in metal-to-metal contact with Sagusa’s base metal.”

It appears that the Examiner improperly pieced together various aspects of the present invention from the prior art based on hindsight gleaned from the present specification and with the invention as a road map to make an obviousness rejection. As detailed below, the Examiner’s asserted combination of McMillin et al. and Sagusa et al. fails to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a).

The Examiner has the initial burden of presenting a *prima facie* case of unpatentability. To establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), three basic criteria must be met. First, the prior art references when combined must teach or suggest all the claim elements. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Finally, there must be a reasonable expectation of success. See

M.P.E.P. § 2143. Furthermore, case law in this context indicates that the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and that the evidence of a teaching, suggestion, or motivation to combine must be “clear and particular.”

As to the first criterion for a proper *prima facie* case of obviousness, McMillin et al. and Sagusa et al., taken either alone or in combination, do not teach or suggest all the claimed elements. For example, an electrode resulting from the asserted combination of McMillin et al. and Sagusa et al. would not have a core metal plate “entirely surrounded by the base metal and ... entirely in metal-to-metal contact with the base metal,” as recited in independent claims 2 and 13. Instead, the lower electrode 2 (asserted by the Examiner as corresponding to the recited core metal plate) would have at least one surface contacting with the electrode cap 1, as shown in Fig. 1. For at least this reason, the first criterion for a proper *prima facie* case of obviousness has not been met.

As to the second criterion, there is no suggestion or motivation in either McMillin et al. and Sagusa et al. to combine or modify the asserted teachings of the references in the manner proposed by the Examiner. The Examiner merely asserts that the motivation for McMillin et al. to encase the electrode 1, heater 6a, and core metal plate 2 in Sagusa et al.’s base metal is to prevent gas discharge within vacuum devices.” However, the Examiner’s asserted motivation is merely a conclusory statement and does not provide sufficient reasoning as to why preventing gas discharge in McMillin et al.’s device would have been desired by one of ordinary skill in the art considering McMillin et al.’s device.

Moreover, the purpose of covering the cast heater plate 10 with the aluminum rolled material 13 in Sagusa et al. is to prevent gas release from the heater plate 10, the problem of which is unique to a cast heater plate, where the molten metal is oxidized during casting to produce a number of cavities and/or pinholes, through which moisture or the like is absorbed and released later. See, e.g., paragraphs [0005] and [0006]. The heater device of McMillin et al., however, does not include a cast heater plate. Therefore, one of ordinary skill in the art considering the teachings of Sagusa et al. would not have been motivated to combine those references in the manner suggested by the Examiner.

As is abundantly clear, the Examiner's asserted motivation is a result of impermissible hindsight gleaned from the present application, which discloses novel and non-obvious subject matter. When the references are viewed without such hindsight, one of ordinary skill in the art considering McMillin et al.' device would not have been motivated to cover its device with an aluminum rolled material of Sagusa et al. in the manner proposed by the Examiner, since there is no "clear and particular" reason to do so. For at least these reasons, Applicants respectfully submit that at least the second criterion for a *prima facie* case of obviousness has not been met.

As to the third criterion, the asserted combination of McMillin et al. and Sagusa et al. does not show a reasonable expectation of success because it is unclear how the electrode 1, heater 6a, and core metal plate 2 of McMillin et al. could be incorporated into the device of Sagusa et al. For at least this reason, Applicants respectfully submit that the third criterion for a *facie* case of obviousness also has not been met.

For at least these reasons set forth above, Applicants respectfully submit that a *prima facie* case of obviousness under 35 U.S.C. § 103(a) has not been properly established. Consequently, independent claims 2 and 13 and their respective dependent claims define novel and non-obvious subject matter over the asserted combination of McMillin et al. and Sagusa et al. Thus, reconsideration and withdrawal of this ground of rejection is respectfully requested.

Independent Claim 12 and Its Dependent Claim

Independent claim 12 recites a plasma processing apparatus including an electrode having similar recitations to those of independent claim 1.

Sagusa et al.'s numerous deficiencies were discussed above in detail. McMillin et al. also does not make up for the deficiencies of Sagusa et al. That is, McMillin et al. also fails to disclose or suggest an electrode having "a base metal made of a cast metal," "an upper ceramic-metal composite arranged above the heater," and "an lower ceramic-metal composite arranged below the heater," "wherein the heater and the upper and lower ceramic-metal composites are cast in the base metal, and each of the upper and lower ceramic-metal composites comprises a preformed porous ceramic infiltrated with the base metal," as recited in each of independent claims 1 and 12.

For at least these reasons, independent claim 12 and dependent claim 15 are both patentably distinguishable over the asserted combination of McMillin et al. and Sagusa et al. Thus, reconsideration and withdrawal of this ground of rejection is respectfully requested.

35 U.S.C. § 103 Rejection Based on McMillin et al., Sagusa et al., and Wang et al.

Claims 3, 4, 14, 15, 24, and 26 were rejected under 35 U.S.C. § 103(a) as being unpatentable over McMillin et al., Sagusa et al., and Shackelford, in view of Wang et al., according to the rationale discussed in paragraph 9 of the final Office Action.

Dependent claims 3 and 4 depend from independent claim 2, dependent claim 14 depends from independent claim 13, dependent claim 15 depends from independent claim 12, and dependent claims 24 and 25 depend from independent claim 1. As discussed above, independent claims 1, 2, 12, and 13 are patentably distinguishable over McMillin et al. and Sagusa et al. Moreover, Wang et al. does not cure the deficiencies of McMillin et al. and Sagusa et al. Consequently, these dependent claims should also be allowable at least by virtue of their dependency from allowable independent claims 1, 2, 12, and 13. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

35 U.S.C. § 103 Rejections Warmough and Sagusa et al.

Claims 22 and 23 are rejected under 35 U.S.C. §103(a) as being unpatentable over Warmough (U.S. Patent No. 4,404,262) in view of Sagusa et al., according to the rationale discussed in paragraph 12 of the Office Action.

Each of independent claims 22 and 23 recites a method including, among other things, “placing a heater and a pair of porous ceramics in a mold with a positional relationship where the pair of porous ceramics are arranged above and below the heater respectively so that the heater is positioned therebetween,” and “pouring a molten base metal into the mold to cast the pair of porous ceramics and the heater in

the base metal, thereby infiltrating the porous ceramic with the base metal in order to form a ceramic-metal composite.”

The Examiner admits that Watmough does not teach any method having a step of placing a heater inside the ceramic prior to the composite forming step.

Nevertheless, the Examiner alleges that “[i]t would have been obvious ... to cast the apparatus of Sagusa following the method of Watmough to form a ceramic-metal composition ... [for] added strength.”

Applicants respectfully submit that this allegation also fails to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a).

As to the first criterion, in particular, the asserted combination of Watmough and Sagusa et al. does not teach or suggest all of the claimed elements. The Examiner relies on Sagusa et al. for its alleged teaching of “[casting] the pair of porous ceramics and the heater in the base metal.” As discussed above, Sagusa et al. does not disclose any step of casting the pair of porous ceramics and the heater in a base metal. In fact, Sagusa et al. does not even disclose a pair of porous ceramics. Thus, the first criterion for a proper *prima facie* case of obviousness has not been met.

As to the third criterion, not only does the asserted combination of Watmough and Sagusa et al. fail to teach or suggest the claimed invention, the combination does not show any reasonable expectation of success. For example, even if the Watmough’s method were somehow applied in making an electrode or a susceptor having a heater, the heater placed in a female mold portion 22 of Watmough would most likely be dislocated from its appropriate position or become warped, resulting in a defective electrode or susceptor. It appears that the Watmough’s method can be used only when

a single porous material is placed at the bottom of the female mold portion 22, and no other component part exists in the female mold portion 22. Therefore, one of ordinary skill in the art would not have a reasonable expectation of success in combining the teachings of Watmough and Sagusa et al. Thus, the third criterion for a proper *prima facie* case of obviousness also has not been met.

For at least the reasons set forth above, Applicants respectfully submit that the cited prior art does not establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a). Thus, reconsideration and withdrawal of this rejection is respectfully requested.

Other Remaining Rejections Under 35 U.S.C. § 103

Claim 18 is rejected under 35 U.S.C. § 103(a) as being unpatentable over McMillin et al. in view of Fukasawa et al. (U.S. Patent No. 5,310,453); claim 24 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Sagusa et al. in view of Wang et al.; claim 25 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Sagusa et al. in view of McMillin et al.

Dependent claim 18 depends from independent claim 16, and dependent claims 24 and 25 depend from independent claim 1. As discussed above, independent claims 1 and 16 are patentably distinguishable over McMillin et al. and Sagusa et al. Moreover, neither Wang et al. or Fukasawa et al. cures the deficiencies of McMillin et al. and Sagusa et al. Consequently, dependent claims 18, 24, and 25 should also be allowable at least by virtue of their dependency from allowable independent claims 1 and 16. Thus, reconsideration and withdrawal of this rejection is respectfully requested.

Conclusion

Applicants respectfully request that this Amendment After Final under 37 C.F.R. § 1.116 be entered, placing all pending claims 1-30 in condition for allowance.

Applicants also submit that the proposed amendments of claims 13 and 30 do not raise new issues or necessitate the undertaking of any additional search of the art by the Examiner, since all of the elements and their relationships were previously claimed and considered by the Examiner.

It is respectfully submitted that all pending claims 1-30 are in condition for allowance. Therefore, timely issuance of a Notice of Allowability is respectfully requested.

The final Office Action contains a number of statements and characterizations regarding the claims and the related art. Applicants decline to subscribe automatically to any statement or characterization in the final Office Action, regardless of whether it is addressed above.


The Examiner is invited to call the undersigned (571-203-2735) if a telephone conversation might advance prosecution of the application.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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